Concrete (block, cast)

Factsheet from Coconino County Sustainable Building Program
New types of concrete block and advances in rigid foam insulation have combined to provide concrete block building systems that are more energy efficient.

Concrete Masonry Units
There are three types of blocks available on the market. ***Interior Insulated Blocks*** are the traditional cinder blocks that many are familiar with. Newer blocks are 25% lighter in weight and have water repellent mixed into the block during manufacturing. Insulation is applied inside the house. With ***Exterior Insulated Blocks*** a new exterior finsih system that imitates stucco or stone is applied on the outside of the blocks. Plumbing and wiring can be run through the block cavities and the inside can be finished with drywall if desired. This is the most energy-efficient of the blocks because the insualtion is on the outside (where temperature changes occur) and the thermal mass of the concrete is on the inside. It is also the most expensive of the block choices. There are three types of ***In-Block Insulation***. With ***Cavity Insulated Blocks*** the insulation is either rigid form inserted in the block cavities at the plant, loose fill material puored in the cavities once the wall is up, or expanding foam sprayed into the cavities during construction. with this method you can achieve moderate R values. Higher R values are achieved with ***Pre-Insulated Block***. Foam beads mixed right into the block at the plant raise the blocks to an R-8. Additional foam inserts in the cavities can raise the R value to 20. Also, these blocks are lighter and can be cut, nailed, and screwed like wood. ***Mortarless Insulated Blocks*** are "dry stacked" with foam insulation placed in the cavities. The blocks are coated inside and out with a bonding cement that acts as a moisture barrier and holds the blocks together. ***Concrete Form Masonry Units*** are a hybrid design that blends unit masonry construction and cast-in-place concrete construction.After a block wall has been laid to a certain height, the interior cavity is filled with grout and reinforcing.

Autoclaved Aerated Concrete
These masonry blocks are manufactured with aggregates no bigger than a grain of sand and an expanding agent that fills the block with numerous air pockets. In use in Europe for some time these blocks are just finding their way into the American market. Up to 80% air, these blocks are lighter and offer greater thermal insulation than standard blocks (can save up to 50% in heating costs over standard masonry blocks).

Removable Forms (Cast-in-Place)
Traditional concrete forming technique uses temporary forms, typically made of aluminum. Rigid foam insulation is placed between the forms and held in place with a system of ties. Concrete is then poured on either side of the foam. Steel rebar is used to add strength to the wall. Once the concrete has cured, the forms are removed and re-used. Because walls are all poured at once, cast-in-place systems are well-suited for production housing where repetition is involved. There are three types of cast-in-place construction: outside walls only; outside and interior walls; and outside, inside and decks (floor and ceiling). The latter is the strongest and most energy efficient. Within these three methods insulation is added on the outside, in the middle (sandwich wall), or on the inside (not used often).

Precast Concrete
Concrete plants take the house plans from the builder and produce all exterior walls, complete with embedded steel reinforcing, electrical wiring and rough openings, and foam insulation. Trucks then carry the panels to the home site where they are crane-lifted into position and connected to the foundation and each other. Construction time can be reduced up to 30% with this method. Foundations and perimeter walls can be erected in hours, and the walls already include all electrical wiring and boxes. **Tilt Up Concrete** is a precast method, but the walls are tilted up into place and do not require a crane. It is difficult to get anything other than a 90 degree wall angle with this method.

Advantages: Durability, strength, good sound absorbtion, excellent fire resistance, improved air quality over stick built homes with glues and other toxic materials.

Appearance/Style: May be left in its natural state for a masonry look or stuccoed.

Structural Requirements : All masonry units are structural and load bearing.

Energy Efficiency : Insulating values for masonry blocks are generally lower than other building materials, but it should be kept in mind that concrete has greater thermal mass than wood. This means that concrete walls will retain heat from the day and radiatethat heat into the house at night. .Insulated Masonry units have R values from 5 to 20. Autoclaved Aereated Concrete has R values between 10 and 24.

Recycled Content: Masonry blocks and concrete don't generally have much recycled content, if any at all. Some companies have made an effort to use fly ash and gypsum in the production of their products. Aerated concrete claims there is no waste material in production or on-site, and no noxious gases cretaed during manufacturing.

Health Issues: Concrete materials are non-toxic.

Ease of Construction: Cast concrete sill require large forms and an exprienced crew. Masonry walls are labor intensive.

Cost estimates: Concrete built homes cost from 0 to 5% more than a traditional wood frame house, depending on the type of construction.

Considerations: Concrete offers a variety of opportunities. Since the different materials are so diverse, it is wise to use the resources below and do more investigation.

Resources :
www.ncma.org - *National Concrete Masonry Association*
www.aacpa.org - *Autoclaved Aerated ConcreteProducts Association*
www.concretehomescouncil.org - *Concrete form home construction*
www.concretehomes.com - *Info on all types of concrete construction*
www.pci.org - *Precast Concrete Institute*
www.tilt-up.com - *Info on tilt-up concrete construction*

Local /Statewide Vendors:

E-Crete
6617 North Scottsdale Rd., Suite 203
Scottsdale, AZ 85250
(888) 432-7383 or (480) 596-3819
www.e-crete.com
Aerated concrete products

Block-Lite
3900 E Industrial Dr
Flagstaff, AZ 86004
928.526.1118
www.block-lite.com
manufacturer of masonry blocks